Journal of Athletic Training 2017;52(5):446–456
doi: 10.4085/1062-6050-52.2.15
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original research

Descriptive Epidemiology of Non–Time-Loss Injuries in Collegiate and High School Student-Athletes

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Context: Research on non–time-loss (NTL) injuries, which result in less than 24 hours of restriction from participation, is limited.

Objective: To describe the epidemiology of NTL injuries among collegiate and high school student-athletes.

Design: Descriptive epidemiology study.

Setting: Aggregate injury and exposure data collected from a convenience sample of National College Athletic Association varsity teams and 147 high schools in 26 states.

Patients or Other Participants: Collegiate and high school student-athletes participating in men's and boys' baseball, basketball, football, lacrosse, soccer, and wrestling and women's and girls' basketball, field hockey, lacrosse, soccer, softball, and volleyball during the 2009–2010 through 2013–2014 and the 2011–2012 through 2013–2014 academic years, respectively, participated. Collegiate student-athletes participating in men's and women's ice hockey were also included.

Main Outcome Measure(s): Injury data from the National Collegiate Athletic Association Injury Surveillance Program and the National Athletic Treatment, Injury and Outcomes Network were analyzed. Injury counts, rates per 1000 athlete-exposures (AEs), and rate ratios were reported with 95% confidence intervals (CIs).

Results: A total of 11 899 and 30 122 NTL injuries were reported in collegiate and high school student-athletes, respectively. The proportion of NTL injuries in high school student-athletes (80.3%) was 1.61 times greater than that of collegiate student-athletes (49.9%; 95% CI = 1.59, 1.63). The NTL injury rate in high school student-athletes (8.75/1000 athlete-exposures [AEs]) was 2.18 times greater than that of collegiate student-athletes (4.02/1000 AEs; 95% CI = 2.13, 2.22). Men's ice hockey (5.27/1000 AEs) and boys' football (11.94/1000 AEs) had the highest NTL injury rates among collegiate and high school athletes, respectively. Commonly injured body parts in collegiate and high school student-athletes were the hip/thigh/upper leg (17.5%) and hand/wrist (18.2%), respectively. At both levels, contusions, sprains, and strains were the most frequent diagnoses. Contact with another player was the most cited injury mechanism (college = 38.0%, high school = 46.3%).

Conclusions: Non–time-loss injuries compose large proportions of collegiate and high school sports injuries. However, the NTL injury rate was higher in high school than in collegiate student-athletes. Tracking NTL injuries will help to better describe the breadth of injuries sustained by athletes and managed by athletic trainers.

Key Words: injury incidence, injury surveillance, sports

Key Points

- The proportion and rates of non–time-loss (NTL) injuries were higher among high school than collegiate student-athletes.
- The greater rate of NTL injuries among high school student-athletes was consistent across sports.
- Most NTL injuries were sprains, strains, or contusions.

Athletic trainers (ATs) and other clinicians working with athletes commonly report very high workloads spread among few medical staff members.[1,2] In addition to being understaffed in many settings, ATs must manage a large load of musculoskeletal, systematic, and other related physical impairments of the athletes for whom they provide care. Understanding the burden of this workload is essential to ensuring that the best possible care is afforded to athletes of all skill levels.

Authors of epidemiologic investigations of injury burden in various athletic populations have focused on *time-loss (TL) injuries*,[3–5] which are typically defined as injuries that restrict the athlete's participation for at least 24 hours beyond the report of injury.[6–8] Using this definition, researchers have highlighted injury rates in practices and competitions[5] and described injury patterns among various high school[9] and collegiate sports.[10] Whereas a standard definition is important for comparing findings across multiple studies, this definition excludes any reported injury that does not result in restriction from participation for at least 24 hours. Such injuries that do not meet that TL criterion are usually known as *non–time-loss (NTL) injuries*.[11,12] Thus, injury rates reported in these studies

Table 1. Participation and Counts of Non–Time-Loss Injuries Among Collegiate and High School Student-Athletes by Sport[a]

Sport	National Collegiate Athletic Association Injury Surveillance Program			National Athletic Treatment, Injury and Outcomes Network Surveillance Program			Injury Proportion Ratio (95% Confidence Interval)[b]
	Participating Programs, Average Annual No.	Non–Time-Loss Injuries, No.	Non–Time-Loss Injuries Among All Injuries, %	Participating Programs, Average Annual No.	Non–Time-Loss Injuries, No.	Non–Time-Loss Injuries Among All Injuries, %	
Men's or boys'							
Baseball	14	500	59.1	40	968	85.2	1.44 (1.36, 1.53)
Basketball	28	1055	57.4	48	2089	78.3	1.36 (1.31, 1.43)
Football	25	3989	46.0	54	13 222	78.1	1.70 (1.66, 1.74)
Ice hockey	18	1491	55.1	NA	NA	NA	NA
Lacrosse	11	437	49.2	20	1506	84.3	1.71 (1.60, 1.84)
Soccer	19	590	45.2	34	1579	83.0	1.84 (1.72, 1.96)
Wrestling	7	369	37.0	41	2170	78.5	2.12 (1.95, 2.31)
Total	122	8431	48.8	237	21 534	79.2	1.62 (1.60, 1.65)
Women's or girls'							
Basketball	29	680	51.7	48	1896	78.7	1.52 (1.44, 1.61)
Field hockey	4	82	51.3	25	1465	86.8	1.69 (1.45, 1.97)
Ice hockey	9	429	56.6	NA	NA	NA	NA
Lacrosse	13	287	52.3	19	982	85.8	1.64 (1.51, 1.78)
Soccer	28	889	46.4	34	1505	81.2	1.75 (1.66, 1.84)
Softball	21	504	61.2	39	882	83.1	1.36 (1.28, 1.44)
Volleyball	27	587	57.4	48	1858	85.9	1.49 (1.41, 1.58)
Total	131	3458	52.9	213	8588	83.2	1.57 (1.54, 1.61)
Overall	253	11 889	49.9	450	30 122	80.3	1.61 (1.59, 1.63)

Abbreviation: NA, not available.

[a] Collegiate data originated from the National Collegiate Athletic Association Injury Surveillance Program, 2009–2010 through 2013–2014 academic years; high school data originated from the National Athletic Treatment, Injury and Outcomes Network Surveillance Program, 2011–2012 through 2013–2014 academic years.

[b] Injury proportion ratio comparing percentage of non–time-loss injuries among all injuries between the National Athletic Treatment, Injury and Outcomes Network Surveillance Program and the National Collegiate Athletic Association Injury Surveillance Program.

do not account for the potentially heavy burden of these NTL injuries.

Several reasons may explain why NTL injuries have not been reported in sport-injury surveillance, with the most likely being the burden this reporting would place on those recording the data.[6,8,13] Electronic health records are still a fairly new component of many athletic health care facilities. Before these electronic records were available, injury epidemiologic information was recorded by hand, placing a tremendous burden on the ATs responsible for documenting all injuries. As a compromise, early injury-tracking systems excluded NTL injuries. Recent advances in electronic methods of collecting and tracking injury data have enabled epidemiologists to describe all injuries in greater detail.[10,11]

Understanding the prevalence of NTL injuries will lead to a much greater recognition of the burden of injury on athletes, as well as the daily workload of sports medicine clinicians. More importantly, however, describing NTL injuries may lead to preventive measures aimed at overuse injuries, such as tendinopathy and bursitis, or mild to moderate acute injuries, such as contusions, sprains, and strains that do not restrict participation. Athletic trainers work to ensure the health and safety of their student-athletes; thus, NTL injuries may reflect the success of ATs and other health care professionals in detecting and managing injuries in a timely manner. Therefore, the purpose of our study was to describe NTL injuries reported by the National Collegiate Athletic Association (NCAA) Injury Surveillance Program (NCAA-ISP) and the National Athletic Treatment, Injury and Outcomes Network Surveillance Program (NATION-SP). Specifically, we aimed to (1) estimate the NTL injury rates in collegiate and high school student-athletes; (2) describe the distributions of NTL injuries by body part injured, diagnosis, and injury mechanism; and (3) compare NTL injury rates between student-athletes in various collegiate and high school sports and between sexes.

METHODS

The NCAA-ISP is a prospective surveillance program managed by the Datalys Center for Sports Injury Research and Prevention, Inc, an independent, nonprofit provider of epidemiologic research. Data originated from the 2009–2010 through 2013–2014 academic years. The NCAA-ISP included a convenience sample of NCAA varsity teams from 25 sports with ATs reporting injury data. The number of programs providing data varied by sport and year.[8] An average of 122 men's and 131 women's programs participated each year (Table 1).

The NATION-SP examines injuries sustained by high school student-athletes. It has captured data for 27 different high school sports from 147 high schools across 26 states. Four additional sports (boys' ice hockey, water polo, and volleyball and girls' water polo) were included in the NATION-SP but provided only 1 season of data each; therefore, we did not include them in this report. Data originated from the 2011–2012 through 2013–2014 aca-

demic years. An average of 237 boys' and 213 girls' programs participated each year (Table 1).

Sports included in this study at both the collegiate and high school levels were men's and boys' baseball, basketball, football, lacrosse, soccer, and wrestling and women's and girls' basketball, field hockey, lacrosse, soccer, softball, and volleyball. We also included data from collegiate men's and women's ice hockey but not from boys' and girls' ice hockey because the data were insufficient.

The similar methods of the NCAA-ISP and NATION-SP have been described[8,13] but are briefly summarized here. The NCAA-ISP portion of the study was approved by the Research Review Board of the NCAA, and the NATION-SP portion was approved by the Western Institutional Review Board.

Data Collection

The ATs working with participating sports programs attended school-sanctioned practices (including team conditioning sessions) and competitions and recorded the number of student-athletes participating in each event.[8,13] They reported injuries in real time using the electronic health record application throughout the academic year. The surveillance systems also captured other sport-related adverse health events, such as illnesses, heat-related conditions, general medical conditions, and skin infections. Only varsity-level practice and competition events were included. Individual weight-lifting and conditioning sessions were excluded.

When reporting an injury, ATs completed a detailed description, including body site and diagnosis. In addition, related aspects, such as activity, injury mechanism, and event type (ie, competition or practice) were included. After initially entering injury data, the ATs could return to view and update the data as needed over a season, such as when the student-athlete returned to sport participation.

From the electronic health record application, common data elements that included injury and exposure information were stripped of any identifiers and personally identifiable information; only relevant variables and values were retained.[8,13] Frequency of export or submission of data varied slightly among the vendors providing the electronic health record applications. This common data-element standard allowed ATs to record injury information as they normally would in their daily clinical practice rather than having to separately report injuries for ISP purposes. Collecting data through preexisting electronic health record systems, coupled with eliminating duplicate data entry, helped to ensure that as many injuries as possible that were detected and managed by team medical staff were captured and, thus, reported to the NCAA-ISP and NATION-SP.

Exported data passed through an automated verification process that includes a series of consistency checks. Data were reviewed and flagged for invalid values. The AT and data–quality-assurance staff were notified and worked together to resolve the concern. Data that successfully passed the verification process were placed into datasets.

All electronic health record applications had to successfully complete a data-validation process to be certified. Certification involved having data–quality-control staff practice data collection; data were entered into the injury-documentation application in the same manner as a participating AT would enter data. These data would then have successfully passed through the automated verification process and would land in the research database with the expected values.

Definitions

Injury. A *reportable injury* in both the NCAA-ISP and NATION-SP during the study periods was defined as an injury that occurred because of participation in an organized collegiate or high school practice or competition and required attention from an AT or physician. Multiple injuries could be included as the result of 1 injury event.

Non–Time-Loss Injury. An *NTL injury* was defined as any injury that was evaluated or treated by an AT or physician but did not result in restriction from participation beyond the day of injury. Concussions, fractures, and dental injuries of any TL amount were excluded from analysis, as these have been historically classified as TL injuries.[8,13,14]

Athlete-Exposure. A reportable *athlete-exposure* (AE) was defined as 1 student-athlete participating in 1 NCAA- or high school–sanctioned practice or competition in which he or she was exposed to the possibility of athletic injury, regardless of the time associated with that participation.[8,13] Only student-athletes with actual playing time in a competition were included in competition exposures.[8,13]

Event Type. *Event type* was the specific event (ie, practice [including team conditioning sessions], competition) in which the injury was reported to have occurred.

Statistical Analysis

We performed frequency analyses on the NTL injuries reported for both the NCAA-ISP and NATION-SP to assess injury rates and the distributions of injuries by body part, diagnosis, and injury mechanism. Given the numerous options from which ATs could select body parts injured, diagnoses, and injury mechanisms, we grouped these variables into categories. Body part categories were head/face; neck; shoulder; arm/elbow; hand/wrist; trunk; hip/thigh/upper leg; knee; lower leg; ankle; foot; and other, including systemic conditions, such as heat illness. Diagnosis categories were abrasion; contusion; dislocation; entrapment/impingement; inflammation, including arthritis or chondromalacia, bursitis, capsulitis, compartment syndrome, effusion, exostosis, osteochondritis, synovitis, tendonitis, tenosynovitis, and other unspecified inflammation; laceration; spasm; sprain; strain; subluxation; and other. Whereas fractures and concussions are typical diagnosis categories, too few were reported as NTL injuries to merit their own categories. Injury-mechanism categories were player contact, surface contact, ball/puck contact, bat/stick contact, other equipment contact (eg, contact with bases in softball, contact with boards in ice hockey), contact with out-of-bounds object, noncontact, overuse, illness/infection, and missing.

We used rate ratios (RRs) and injury proportion ratios (IPRs) to examine differences by level of competition (ie, collegiate and high school) and sex among sex-comparable sports (ie, baseball and softball, basketball, ice hockey, lacrosse, soccer). All 95% confidence intervals (CIs) that

Table 2. Rates of Non–Time-Loss Injuries Among Collegiate and High School Student-Athletes by Sport[a]

Sport	National Collegiate Athletic Association Injury Surveillance Program Rates (95% Confidence Interval) per 1000 Athlete-Exposures	National Athletic Treatment, Injury and Outcomes Network Surveillance Program Rates (95% Confidence Interval) per 1000 Athlete-Exposures	Rate Ratio (95% Confidence Interval)[b]
Men's or boys'			
Baseball	2.81 (2.56, 3.06)	4.64 (4.34, 4.93)	1.65 (1.48, 1.84)
Basketball	4.89 (4.59, 5.18)	5.73 (5.48, 5.98)	1.17 (1.09, 1.26)
Football	4.44 (4.30, 4.57)	11.94 (11.74, 12.14)	2.69 (2.60, 2.79)
Ice hockey	5.27 (5.00, 5.53)	Not available	Not applicable
Lacrosse	2.72 (2.47, 2.98)	9.02 (8.57, 9.48)	3.31 (2.98, 3.69)
Soccer	3.69 (3.40, 3.99)	7.57 (7.19, 7.94)	2.05 (1.86, 2.25)
Wrestling	4.69 (4.21, 5.17)	9.13 (8.74, 9.51)	1.95 (1.74, 2.17)
Total	4.27 (4.18, 4.36)	9.39 (9.26, 9.51)	2.20 (2.14, 2.26)
Women's or girls'			
Basketball	3.49 (3.23, 3.75)	6.57 (6.27, 6.87)	1.88 (1.72, 2.05)
Field hockey	2.20 (1.72, 2.68)	9.82 (9.32, 10.32)	4.46 (3.57, 5.58)
Ice hockey	3.79 (3.43, 4.15)	Not available	Not applicable
Lacrosse	2.72 (2.41, 3.04)	9.71 (9.10, 10.32)	3.57 (3.13, 4.07)
Soccer	4.13 (3.85, 4.40)	8.67 (8.23, 9.11)	2.10 (1.93, 2.28)
Softball	3.12 (2.85, 3.39)	6.30 (5.88, 6.71)	2.02 (1.81, 2.25)
Volleyball	3.75 (3.44, 4.05)	6.27 (5.98, 6.55)	1.67 (1.53, 1.84)
Total	3.51 (3.40, 3.63)	7.47 (7.32, 7.63)	2.13 (2.05, 2.21)
Overall	4.02 (3.94, 4.09)	8.75 (8.65, 8.85)	2.18 (2.13, 2.22)

[a] Collegiate data originated from the National Collegiate Athletic Association Injury Surveillance Program, 2009–2010 through 2013–2014 academic years; high school data originated from the National Athletic Treatment, Injury and Outcomes Network Surveillance Program, 2011–2012 through 2013–2014 academic years.

[b] Rate ratio comparing non–time-loss injury rates overall between the National Athletic Treatment, Injury and Outcomes Network Surveillance Program and the National Collegiate Athletic Association Injury Surveillance Program.

did not include 1.00 were considered different. Data were analyzed using SAS-Enterprise Guide software (version 4.3; SAS Institute Inc, Cary, NC).

RESULTS

Frequencies of NTL Injuries

Among collegiate student-athletes, nearly half (n = 11 899, 49.9%) of all reported injuries were NTL injuries (Table 1). The collegiate sports with the largest proportions of NTL injuries were women's softball (n = 504, 61.2%), men's baseball (n = 500, 59.1%), men's basketball (n = 1055, 57.4%), and women's volleyball (n = 587, 57.4%). Among high school student-athletes, 80.3% (n = 30 122) of all reported injuries were NTL injuries (Table 1). The high school sports with the largest proportions of NTL injuries were girls' field hockey (n = 1465, 86.8%), girls' volleyball (n = 1858, 85.9%), girls' lacrosse (n = 982, 85.8%), and boys' baseball (n = 968, 85.2%).

The proportion of NTL injuries in high school student-athletes (80.3%) was 1.61 times that of collegiate student-athletes (49.9%; 95% CI = 1.59, 1.63). The greater proportion of NTL injuries among high school than collegiate student-athletes was consistent across all sports. Men's and boys' wrestling had the largest disparity between populations (IPR = 2.12; 95% CI = 1.95, 2.31), whereas women's and girls' softball had the smallest disparity (IPR = 1.36; 95% CI = 1.28, 1.44).

Rates of NTL Injuries

In college, the sports with the largest NTL injury rates were men's ice hockey (5.27/1000 AEs), men's basketball (4.89/1000 AEs), and men's wrestling (4.69/1000 AEs); in high school, these sports were boys' football (11.94/1000 AEs), girls' field hockey (9.82/1000 AEs), and girls' lacrosse (9.71/1000 AEs; Table 2). The rate of NTL injuries in high school student-athletes (8.75/1000 AEs) was 2.18 times that of collegiate student-athletes (4.02/1000 AEs; 95% CI = 2.13, 2.22).

Among sex-comparable collegiate sports, the rate of NTL injuries was higher in female than male student-athletes in soccer (RR = 1.11; 95% CI = 1.00, 1.24) but lower in female than male student-athletes in basketball (RR = 0.71; 95% CI = 0.65, 0.78) and ice hockey (RR = 0.72; 95% CI = 0.65, 0.80). In high school, the rate of NTL injuries was higher in female than male student-athletes in softball/baseball (RR = 1.36; 95% CI = 1.24, 1.49), basketball (RR = 1.15; 95% CI = 1.08, 1.22), and soccer (RR = 1.15; 95% CI = 1.07, 1.23).

Characteristics of NTL Injuries

Body Part Injured. Most injuries affected the lower extremity. However, the hip/thigh/upper leg specifically was the most frequently injured body part in collegiate student-athletes overall (n = 2076, 17.5%), collegiate male student-athletes (n = 1430, 17.0%), and collegiate female student-athletes (n = 646, 18.7%; Table 3). In high school student-athletes, the hand/wrist was the most often injured body part overall (n = 5497, 18.2%), for male student-athletes (n = 4058, 18.8%), and for female student-athletes (n = 1439, 16.8%). Certain sports had other more commonly injured body parts. Among collegiate student-athletes, the most frequently injured body parts were the shoulder in men's baseball (n = 89, 17.8%) and men's football (n = 665, 16.7%), the ankle in women's basketball

Table 3. Body Sites of Non–Time-Loss Injuries Among Collegiate and High School Student-Athletes by Sport[a]

	Body Site, Count (%)												
Sport	Head/Face	Neck	Shoulder	Arm/Elbow	Hand/Wrist	Trunk	Hip/Thigh/ Upper Leg	Knee	Lower Leg	Ankle	Foot	Other	Total
National Collegiate Athletic Association Injury Surveillance Program (2009–2010 through 2013–2014)													
Men's sports													
Baseball	12 (2.4)	4 (0.8)	89 (17.8)	75 (15.0)	68 (13.6)	48 (9.6)	73 (14.6)	38 (7.6)	34 (6.8)	22 (4.4)	24 (4.8)	13 (2.6)	500 (100.0)
Basketball	84 (8.0)	11 (1.0)	87 (8.3)	35 (3.3)	113 (10.7)	93 (8.8)	161 (15.3)	142 (13.5)	74 (7.0)	157 (14.9)	83 (7.9)	15 (1.4)	1055 (100.0)
Football	63 (1.6)	207 (5.2)	665 (16.7)	175 (4.4)	485 (12.2)	301 (7.6)	646 (16.2)	503 (12.6)	185 (4.6)	486 (12.2)	176 (4.4)	97 (2.4)	3989 (100.0)
Ice hockey	177 (11.9)	39 (2.6)	208 (14.0)	101 (6.8)	197 (13.2)	158 (10.6)	266 (17.8)	143 (9.6)	43 (2.9)	102 (6.8)	46 (3.1)	11 (0.7)	1491 (100.0)
Lacrosse	12 (2.8)	2 (0.5)	35 (8.0)	27 (6.2)	42 (9.6)	71 (16.3)	87 (19.9)	45 (10.3)	42 (9.6)	53 (12.1)	20 (4.6)	1 (0.2)	437 (100.0)
Soccer	26 (4.4)	3 (0.5)	19 (3.2)	13 (2.2)	35 (5.9)	35 (5.9)	183 (31.0)	75 (12.7)	56 (9.5)	80 (13.6)	50 (8.5)	15 (2.5)	590 (100.0)
Wrestling	38 (10.3)	16 (4.3)	67 (18.2)	18 (4.9)	25 (6.8)	36 (9.8)	14 (3.8)	75 (20.3)	4 (1.1)	20 (5.4)	12 (3.3)	44 (11.9)	369 (100.0)
Total	412 (4.9)	282 (3.3)	1170 (13.9)	444 (5.3)	965 (11.5)	742 (8.8)	1430 (17.0)	1021 (12.1)	438 (5.2)	920 (10.9)	411 (4.9)	196 (2.3)	8431 (100.0)
Women's sports													
Basketball	41 (6.0)	9 (1.3)	40 (5.9)	31 (4.6)	49 (7.2)	40 (5.9)	82 (12.1)	105 (15.4)	89 (13.1)	113 (16.6)	68 (10)	13 (1.9)	680 (100.0)
Field hockey	6 (7.3)	2 (2.4)	2 (2.4)	3 (3.7)	6 (7.3)	6 (7.3)	20 (24.4)	18 (22.0)	4 (4.9)	5 (6.1)	6 (7.3)	4 (4.9)	82 (100.0)
Ice hockey	16 (3.7)	13 (3.0)	36 (8.4)	30 (7.0)	56 (13.1)	69 (16.1)	84 (19.6)	51 (11.9)	23 (5.4)	19 (4.4)	20 (4.7)	12 (2.8)	429 (100.0)
Lacrosse	15 (5.2)	1 (0.4)	10 (3.5)	3 (1.1)	17 (5.9)	20 (7.0)	61 (21.3)	41 (14.3)	47 (16.4)	47 (16.4)	14 (4.9)	11 (3.8)	287 (100.0)
Soccer	47 (5.3)	7 (0.8)	27 (3.0)	8 (0.9)	38 (4.3)	65 (7.3)	225 (25.3)	155 (17.4)	100 (11.3)	125 (14.1)	76 (8.6)	16 (1.8)	889 (100.0)
Softball	20 (4.0)	5 (1.0)	59 (11.7)	42 (8.3)	53 (10.5)	47 (9.3)	97 (19.2)	57 (11.3)	62 (12.3)	27 (5.4)	31 (6.2)	4 (0.8)	504 (100.0)
Volleyball	9 (1.5)	6 (1.0)	66 (11.2)	22 (3.8)	71 (12.1)	79 (13.5)	77 (13.1)	92 (15.7)	62 (10.6)	50 (8.5)	39 (6.6)	14 (2.4)	587 (100.0)
Total	154 (4.5)	43 (1.2)	240 (6.9)	139 (4.0)	290 (8.4)	326 (9.4)	646 (18.7)	519 (15.0)	387 (11.2)	386 (11.2)	254 (7.4)	74 (2.1)	3458 (100.0)
Overall	566 (4.8)	325 (2.7)	1410 (11.9)	583 (4.9)	1255 (10.6)	1068 (9.0)	2076 (17.5)	1540 (13.0)	825 (6.9)	1306 (11.0)	665 (5.6)	270 (2.3)	11 889 (100.0)
National Athletic Treatment, Injury and Outcomes Network Surveillance Program (2011–2012 through 2013–2014)													
Boys' sports													
Baseball	44 (4.6)	5 (0.5)	221 (22.8)	149 (15.4)	160 (16.5)	89 (9.2)	97 (10.0)	72 (7.4)	36 (3.7)	66 (6.8)	25 (2.6)	4 (0.4)	968 (100.0)
Basketball	138 (6.6)	21 (1.0)	73 (3.5)	94 (4.5)	392 (18.8)	153 (7.3)	240 (11.5)	329 (15.8)	119 (5.7)	397 (19.0)	118 (5.7)	15 (0.7)	2089 (100.0)
Football	342 (2.6)	360 (2.7)	984 (7.4)	1597 (12.1)	2863 (21.7)	975 (7.4)	1545 (11.7)	1463 (11.1)	826 (6.3)	1359 (10.3)	764 (5.8)	144 (1.1)	13 222 (100.0)
Lacrosse	38 (2.5)	33 (2.2)	87 (5.8)	80 (5.3)	195 (13.0)	140 (9.3)	219 (14.5)	221 (14.7)	165 (11.0)	208 (13.8)	112 (7.4)	8 (0.5)	1506 (100.0)
Soccer	62 (3.9)	6 (0.4)	35 (2.2)	17 (1.1)	94 (6.0)	102 (6.5)	377 (23.9)	253 (16.0)	188 (11.9)	283 (17.9)	159 (10.1)	3 (0.2)	1579 (100.0)
Wrestling	260 (12.0)	48 (2.2)	246 (11.3)	212 (9.8)	354 (16.3)	200 (9.2)	113 (5.2)	390 (18.0)	98 (4.5)	122 (5.6)	75 (3.5)	52 (2.4)	2170 (100.0)
Total	884 (4.1)	473 (2.2)	1646 (7.6)	2149 (10.0)	4058 (18.8)	1659 (7.7)	2591 (12.0)	2728 (12.7)	1432 (6.6)	2435 (11.3)	1253 (5.8)	226 (1.0)	21 534 (100.0)
Girls' sports													
Basketball	84 (4.4)	26 (1.4)	54 (2.9)	69 (3.6)	387 (20.4)	103 (5.4)	174 (9.2)	317 (16.7)	166 (8.8)	353 (18.6)	149 (7.9)	14 (0.7)	1896 (100.0)
Field hockey	58 (4.0)	14 (1.0)	28 (1.9)	28 (1.9)	198 (13.5)	104 (7.1)	287 (19.6)	223 (15.2)	153 (10.4)	178 (12.2)	190 (13.0)	4 (0.3)	1465 (100.0)
Lacrosse	43 (4.4)	12 (1.2)	34 (3.5)	24 (2.4)	77 (7.8)	64 (6.5)	165 (16.8)	173 (17.6)	132 (13.4)	151 (15.4)	105 (10.7)	2 (0.2)	982 (100.0)
Soccer	43 (2.9)	12 (0.8)	28 (1.9)	16 (1.1)	83 (5.5)	59 (3.9)	316 (21.0)	264 (17.5)	151 (10.0)	358 (23.8)	171 (11.4)	4 (0.3)	1505 (100.0)
Softball	57 (6.5)	10 (1.1)	135 (15.3)	142 (16.1)	140 (15.9)	65 (7.4)	79 (9.0)	79 (9.0)	58 (6.6)	83 (9.4)	33 (3.7)	1 (0.1)	882 (100.0)
Volleyball	32 (1.7)	17 (0.9)	198 (10.7)	88 (4.7)	554 (29.8)	123 (6.6)	131 (7.1)	244 (13.1)	108 (5.8)	245 (13.2)	110 (5.9)	8 (0.4)	1858 (100.0)
Total	317 (3.7)	91 (1.1)	477 (5.6)	367 (4.3)	1439 (16.8)	518 (6.0)	1152 (13.4)	1300 (15.1)	768 (8.9)	1368 (15.9)	758 (8.8)	33 (0.4)	8588 (100.0)
Overall	1201 (4.0)	564 (1.9)	2123 (7.0)	2516 (8.4)	5497 (18.2)	2177 (7.2)	3743 (12.4)	4028 (13.4)	2200 (7.3)	3803 (12.6)	2011 (6.7)	259 (0.9)	30 122 (100.0)

[a] Collegiate data were from the National Collegiate Athletic Association Injury Surveillance Program; high school data, from the National Athletic Treatment, Injury and Outcomes Network Surveillance Program.

(n = 113, 16.6%), and the knee in men's wrestling (n = 75, 20.3%) and women's volleyball (n = 92, 15.7%). Among high school student-athletes, the most commonly injured body parts were the shoulder in boys' baseball (n = 221, 22.8%); the ankle in boys' basketball (n = 397, 19.0%); the knee in boys' lacrosse (n = 221, 14.7%), boys' wrestling (n = 390, 18.0%), and girls' lacrosse (n = 173, 17.6%); the hip/thigh/upper leg in boys' soccer (n = 377, 23.9%), girls' field hockey (n = 287, 19.6%), and girls' soccer (n = 316, 21.0%); and the arm/elbow in girls' softball (n = 142, 16.1%).

Diagnosis. At both the collegiate and high school levels, contusions, sprains, and strains composed the largest proportion of NTL injuries (Table 4). Among collegiate student-athletes, the most frequent diagnoses were contusions in men's baseball (n = 120, 24.0%), men's ice hockey (n = 507, 34.0%), men's lacrosse (n = 106, 24.2%), women's field hockey (n = 26, 31.7%), and women's ice hockey (n = 107, 24.9%); sprains in men's basketball (n = 285, 27.0%), men's football (n = 1173, 29.4%), men's wrestling (n = 90, 24.4%), and women's basketball (n = 185, 27.2%); and strains in men's soccer (n = 175, 29.6%), women's lacrosse (n = 59, 20.5%), women's soccer (n = 209, 23.5%), women's softball (n = 141, 28.0%), and women's volleyball (n = 150, 25.6%). Among high school student-athletes, the most common diagnosis in all sports was contusion (n = 11 577, 38.4% overall).

Injury Mechanism. Player contact was the most frequent injury mechanism in collegiate student-athletes overall (n = 4173, 38.0%), collegiate male student-athletes (n = 3485, 44.8%), high school student-athletes overall (n = 12 784, 46.3%), high school male student-athletes (n = 9803, 49.2%), and high school female student-athletes (n = 2981, 38.5%; Table 5). Among collegiate female student-athletes, noncontact was the most common injury mechanism (n = 873, 27.3%). However, certain collegiate sports had other more frequent injury mechanisms. Among collegiate student-athletes, the most common injury mechanism was player contact in women's basketball (n = 205, 33.0%) and women's soccer (n = 282, 33.9%) and overuse in men's baseball (n = 146, 30.6%), women's field hockey (n = 23, 31.5%), women's softball (n = 135, 28.9%), and women's volleyball (n = 183, 33.5%). In high school student-athletes, the most frequent injury mechanism was noncontact in boys' baseball (n = 353, 36.7%) and ball/puck contact in girls' field hockey (n = 368, 30.3%).

DISCUSSION

To our knowledge, we are the first to focus specifically on NTL injuries in the collegiate and high school sport settings. An understanding of NTL injuries is important to enumerate the full burden placed on ATs in these settings. School boards and athletic departments should consider these findings and the effects of both TL and NTL injuries as they make staffing decisions to ensure that student-athletes are afforded the best possible injury prevention, care, monitoring, and management.

Compared with TL injuries, NTL injuries potentially place the same or a greater burden on the medical care provider.[15] Sports medicine clinicians focus on keeping athletes healthy enough to compete safely in all physical activity. In many cases, medical providers spend substantial time managing athletes who have chronic or overuse injuries, some of which result in no TL. Researchers[15] have reported that NTL injury rates were more than 3 times greater than TL injury rates. Importantly, NTL injuries also required more treatments over a year than did TL injuries.[15] Thus, whereas NTL injuries may not result in long durations of missed participation time, they often require diligent management by the AT to allow the athlete to continue participating. Furthermore, injury and resulting chronic pain can be associated with lower-quality physical health later in life.[16–18] Therefore, preventive measures aimed at NTL injuries may help to increase later quality of life for former athletes.

Differences Between Collegiate and High School Sports

Our main finding was that the rate of NTL injuries at the high school level was more than twice the rate at the collegiate level. This greater rate of NTL injury in high school student-athletes was consistent across all sports with available data from both populations. We also observed a higher proportion of NTL injuries among injuries sustained in high school than in college. This increased proportion of NTL injuries was also consistent across all sports. Unlike colleges and universities, many high schools do not employ full-time ATs.[19] Beyond staffing concerns, high school ATs often work on very limited budgets and are frequently unable to afford important rehabilitative tools and modalities that may improve athlete care. As a result, injured student-athletes may need to seek care for more severe injuries from outside medical facilities. Future investigators examining the care-seeking decisions of injured student-athletes may help to identify areas of need and collaboration with outside medical care.

The higher rate of NTL injury in high school than collegiate student-athletes may be due to several factors, including the diagnoses of these injuries. For example, high school student-athletes had a higher proportion of contusions and lacerations than collegiate student-athletes (38.4% versus 21.3%). It is possible that the lower proportion of these injuries in collegiate student-athletes is due not to a lower incidence of these injuries but to decreased reporting. Collegiate student-athletes may be more likely to care for contusions and abrasions themselves instead of seeking medical attention from ATs, resulting in nonreporting of these injuries. The high school level may include participants who are new to a specific sport,[20,21] whereas collegiate-level sports traditionally recruit student-athletes with a history of success in their sport. This may lead to increased reporting of less severe NTL injuries in high school student-athletes who are learning new skills required for the sport. Future research on NTL injuries should address these 2 factors.

Comparison With Previous Research

The rate of NTL injury that we observed in collegiate student-athletes (4.02/1000 AEs) was much lower than rates in a previous study[15] of 13.0/1000 AEs to 33.2/1000 AEs in student-athletes from all 3 NCAA divisions, the National Association of Intercollegiate Athletics, and the National Junior Collegiate Athletic Association. In addition, Dompier et al[22] calculated NTL rates in youth football

Table 4. Diagnoses of Non–Time-Loss Injuries Among Collegiate and High School Student-Athletes by Sport[a]

	Diagnosis, Count (%)											
Sport	Abrasion	Contusion	Dislocation	Entrapment/ Impingement	Inflammation[b]	Laceration	Spasm	Sprain	Strain	Subluxation	Other	Total
National Collegiate Athletic Association Injury Surveillance Program (2009–2010 through 2013–2014)												
Men's sports												
Baseball	5 (1.0)	120 (24.0)	3 (0.6)	13 (2.6)	67 (13.4)	6 (1.2)	20 (4.0)	43 (8.6)	119 (23.8)	5 (1.0)	99 (19.8)	500 (100.0)
Basketball	4 (0.4)	216 (20.4)	14 (1.3)	2 (0.2)	131 (12.4)	55 (5.2)	30 (2.8)	285 (27.0)	156 (14.8)	18 (1.7)	144 (13.7)	1055 (100.0)
Football	4 (0.1)	795 (19.9)	74 (1.9)	27 (0.7)	215 (5.4)	33 (0.8)	109 (2.7)	1173 (29.4)	817 (20.5)	115 (2.9)	627 (15.7)	3989 (100.0)
Ice hockey	8 (0.5)	507 (34.0)	12 (0.8)	12 (0.8)	105 (7.0)	192 (12.9)	52 (3.5)	257 (17.2)	217 (14.6)	31 (2.1)	98 (6.6)	1491 (100.0)
Lacrosse	1 (0.2)	106 (24.2)	3 (0.7)	1 (0.2)	45 (10.3)	8 (1.8)	25 (5.7)	98 (22.4)	104 (23.7)	7 (1.6)	39 (8.9)	437 (100.0)
Soccer	2 (0.3)	138 (23.4)	6 (1.0)	0 (0.0)	52 (8.8)	13 (2.2)	11 (1.9)	122 (20.6)	175 (29.6)	2 (0.3)	69 (11.7)	590 (100.0)
Wrestling	0 (0.0)	31 (8.4)	6 (1.6)	15 (4.1)	24 (6.5)	22 (6.0)	11 (3.0)	90 (24.4)	58 (15.7)	9 (2.4)	103 (27.9)	369 (100.0)
Total	24 (0.3)	1913 (22.7)	118 (1.4)	70 (0.8)	639 (7.6)	329 (3.9)	258 (3.1)	2068 (24.5)	1646 (19.5)	187 (2.2)	1179 (14.0)	8431 (100.0)
Women's sports												
Basketball	2 (0.3)	100 (14.7)	4 (0.6)	4 (0.6)	137 (20.2)	12 (1.8)	16 (2.4)	185 (27.2)	119 (17.5)	7 (1.0)	94 (13.8)	680 (100.0)
Field hockey	0 (0.0)	26 (31.7)	0 (0.0)	0 (0.0)	11 (13.4)	1 (1.2)	5 (6.1)	8 (9.8)	14 (17.1)	0 (0.0)	17 (20.7)	82 (100.0)
Ice hockey	0 (0.0)	107 (24.9)	0 (0.0)	4 (0.9)	48 (11.2)	4 (0.9)	17 (4.0)	66 (15.4)	104 (24.2)	7 (1.6)	72 (16.7)	429 (100.0)
Lacrosse	2 (0.7)	49 (17.0)	1 (0.4)	1 (0.4)	50 (17.4)	2 (0.7)	10 (3.5)	51 (17.7)	59 (20.5)	6 (2.1)	56 (19.5)	287 (100.0)
Soccer	1 (0.1)	198 (22.3)	1 (0.1)	7 (0.8)	121 (13.6)	12 (1.4)	34 (3.8)	168 (18.9)	209 (23.5)	10 (1.1)	128 (14.4)	889 (100.0)
Softball	2 (0.4)	106 (21.0)	1 (0.2)	8 (1.6)	72 (14.3)	2 (0.4)	15 (3.0)	63 (12.5)	141 (28.0)	8 (1.6)	86 (17.1)	504 (100.0)
Volleyball	1 (0.2)	35 (6.0)	2 (0.3)	11 (1.9)	134 (22.8)	3 (0.5)	18 (3.1)	114 (19.4)	150 (25.6)	3 (0.5)	116 (19.8)	587 (100.0)
Total	8 (0.2)	621 (18.0)	9 (0.3)	35 (1.0)	573 (16.6)	36 (1.0)	115 (3.3)	655 (18.9)	796 (23.0)	41 (1.2)	569 (16.5)	3458 (100.0)
Overall	32 (0.3)	2534 (21.3)	127 (1.1)	105 (0.9)	1212 (10.2)	365 (3.1)	373 (3.1)	2723 (22.9)	2442 (20.5)	228 (1.9)	1748 (14.7)	11 889 (100.0)
National Athletic Treatment, Injury and Outcomes Network Surveillance Program (2011–2012 through 2013–2014)												
Boys' sports												
Baseball	168 (17.4)	266 (27.5)	0 (0.0)	4 (0.4)	10 (1.0)	26 (2.7)	2 (0.2)	111 (11.5)	182 (18.8)	2 (0.2)	197 (20.4)	968 (100.0)
Basketball	202 (9.7)	764 (36.6)	4 (0.2)	2 (0.1)	29 (1.4)	88 (4.2)	2 (0.1)	466 (22.3)	249 (11.9)	2 (0.1)	281 (13.5)	2089 (100.0)
Football	1528 (11.6)	5637 (42.6)	20 (0.2)	5 (0.1)	56 (0.4)	294 (2.2)	12 (0.1)	2056 (15.6)	1980 (15.0)	10 (0.1)	1624 (12.3)	13 222 (100.0)
Lacrosse	159 (10.6)	604 (40.1)	0 (0.0)	1 (0.1)	1 (0.1)	61 (4.1)	0 (0.0)	207 (13.8)	261 (17.3)	2 (0.1)	210 (13.9)	1506 (100.0)
Soccer	167 (10.6)	647 (41.0)	0 (0.0)	0 (0.0)	6 (0.4)	59 (3.7)	1 (0.1)	217 (13.7)	292 (18.5)	0 (0.0)	190 (12.0)	1579 (100.0)
Wrestling	268 (12.4)	904 (41.7)	0 (0.0)	1 (0.1)	7 (0.3)	66 (3.0)	3 (0.1)	326 (15.0)	313 (14.4)	2 (0.1)	280 (12.9)	2170 (100.0)
Total	2492 (11.6)	8822 (41.0)	24 (0.1)	13 (0.1)	109 (0.5)	594 (2.8)	20 (0.1)	3383 (15.7)	3277 (15.2)	18 (0.1)	2782 (12.9)	21 534 (100.0)
Girls' sports												
Basketball	238 (12.6)	583 (30.8)	9 (0.5)	0 (0.0)	21 (1.1)	89 (4.7)	3 (0.2)	511 (27.0)	181 (9.6)	0 (0.0)	261 (13.8)	1896 (100.0)
Field hockey	283 (19.3)	505 (34.5)	1 (0.1)	1 (0.1)	8 (0.6)	71 (4.9)	5 (0.3)	126 (8.6)	221 (15.1)	0 (0.0)	244 (16.7)	1465 (100.0)
Lacrosse	152 (15.5)	312 (31.8)	0 (0.0)	0 (0.0)	2 (0.2)	55 (5.6)	0 (0.0)	144 (14.7)	147 (15.0)	0 (0.0)	170 (17.3)	982 (100.0)
Soccer	184 (12.2)	523 (34.8)	0 (0.0)	1 (0.1)	13 (0.9)	57 (3.8)	1 (0.1)	273 (18.1)	239 (15.9)	1 (0.1)	213 (14.2)	1505 (100.0)
Softball	151 (17.1)	317 (35.9)	1 (0.1)	1 (0.1)	21 (2.4)	18 (2.0)	5 (0.6)	89 (10.1)	157 (17.8)	2 (0.2)	120 (13.6)	882 (100.0)
Volleyball	333 (17.9)	515 (27.7)	1 (0.1)	0 (0.0)	21 (1.0)	69 (3.7)	4 (0.2)	415 (22.3)	254 (13.7)	2 (0.1)	244 (13.1)	1858 (100.0)
Total	1341 (15.6)	2755 (32.1)	12 (0.1)	3 (<0.1)	86 (1.0)	359 (4.2)	18 (0.2)	1558 (18.1)	1199 (14.0)	5 (0.1)	1252 (14.6)	8588 (100.0)
Overall	3833 (12.7)	11 577 (38.4)	36 (0.1)	16 (0.1)	195 (0.7)	953 (3.2)	38 (0.1)	4941 (16.4)	4476 (14.9)	23 (0.1)	4034 (13.4)	30 122 (100.0)

[a] Collegiate data were from the National Collegiate Athletic Association, Injury Surveillance Program; high school data, from the National Athletic Treatment, Injury and Outcomes Network Surveillance Program.

[b] Includes arthritis or chondromalacia, bursitis, capsulitis, compartment syndrome, effusion, exostosis, osteochondritis, synovitis, tendinopathy, tenosynovitis, and other unspecified inflammation.

Table 5. Mechanism of Non–Time-Loss Injuries Among Collegiate and High School Student-Athletes by Sport[a]

Sport	Mechanism, No. (%)										
	Player Contact	Surface Contact	Ball/Puck Contact	Bat/Stick Contact	Other Equipment Contact	Contact With Out-of-Bounds Object	Noncontact	Overuse	Illness/Infection	Missing	Total
National Collegiate Athletic Association Injury Surveillance Program (2009–2010 through 2013–2014)											
Men's sports											
Baseball	23 (4.8)	38 (8.0)	100 (21.0)	10 (2.1)	25 (5.2)	3 (0.6)	121 (25.4)	146 (30.6)	11 (2.3)	23	477 (100.0)
Basketball	433 (43.5)	162 (16.3)	20 (2.0)	NA	5 (0.5)	6 (0.6)	244 (24.5)	115 (11.6)	10 (1.0)	60	995 (100.0)
Football	2092 (57.8)	406 (11.2)	40 (1.1)	NA	33 (0.9)	1 (<0.1)	792 (21.9)	198 (5.5)	57 (1.6)	370	3619 (100.0)
Ice hockey	489 (35.5)	97 (7.0)	240 (17.4)	77 (5.6)	175 (12.7)	12 (0.9)	168 (12.2)	113 (8.2)	7 (0.5)	113	1378 (100.0)
Lacrosse	84 (19.8)	34 (8.0)	18 (4.3)	57 (13.4)	0 (0.0)	0 (0.0)	162 (38.2)	67 (15.8)	2 (0.5)	13	424 (100.0)
Soccer	206 (36.9)	62 (11.1)	37 (6.6)	NA	2 (0.4)	1 (0.2)	135 (24.2)	109 (19.5)	7 (1.3)	31	559 (100.0)
Wrestling	158 (47.6)	76 (22.9)	NA	NA	0 (0.0)	1 (0.3)	46 (13.9)	30 (9.0)	21 (6.3)	37	332 (100.0)
Total	3485 (44.8)	875 (11.2)	455 (5.9)	144 (1.9)	240 (3.1)	24 (0.3)	1668 (21.4)	778 (10.0)	115 (1.5)	647	7784 (100.0)
Women's sports											
Basketball	205 (33.0)	93 (15.0)	25 (4.0)	NA	1 (0.2)	2 (0.3)	154 (24.8)	128 (20.6)	13 (2.1)	59	621 (100.0)
Field hockey	8 (11.0)	3 (4.1)	18 (24.7)	3 (4.1)	0 (0.0)	0 (0.0)	15 (20.6)	23 (31.5)	3 (4.1)	9	73 (100.0)
Ice hockey	59 (15.3)	38 (9.8)	65 (16.8)	14 (3.6)	18 (4.7)	10 (2.6)	116 (30.1)	55 (14.3)	11 (2.9)	43	386 (100.0)
Lacrosse	31 (11.5)	26 (9.6)	21 (7.8)	22 (8.2)	1 (0.4)	0 (0.0)	82 (30.4)	77 (28.5)	10 (3.7)	17	270 (100.0)
Soccer	282 (33.9)	85 (10.2)	49 (5.9)	NA	3 (0.4)	0 (0.0)	211 (25.3)	188 (22.6)	15 (1.8)	56	833 (100.0)
Softball	40 (8.6)	51 (10.9)	77 (16.5)	6 (1.3)	18 (3.9)	1 (0.2)	132 (28.3)	135 (28.9)	7 (1.5)	37	467 (100.0)
Volleyball	63 (11.5)	73 (13.4)	53 (9.7)	NA	0 (0.0)	0 (0.0)	163 (29.9)	183 (33.5)	11 (2.0)	41	546 (100.0)
Total	688 (21.5)	369 (11.6)	308 (9.6)	45 (1.4)	41 (1.3)	13 (0.4)	873 (27.3)	789 (24.7)	70 (2.2)	262	3196 (100.0)
Overall	4173 (38.0)	1244 (11.3)	763 (7.0)	189 (1.7)	281 (2.6)	37 (0.3)	2541 (23.1)	1567 (14.3)	185 (1.7)	909	10 980 (100.0)
National Athletic Treatment, Injury and Outcomes Network Surveillance Program (2011–2012 through 2013–2014)											
Boys' sports											
Baseball	277 (28.8)	12 (1.3)	216 (22.5)	1 (0.1)	4 (0.4)	0 (0.0)	353 (36.7)	99 (10.3)	0 (0.0)	6	962 (100.0)
Basketball	833 (43.7)	344 (18.1)	202 (10.6)	NA	2 (0.1)	3 (0.2)	490 (25.7)	29 (1.5)	2 (0.1)	184	1905 (100.0)
Football	5542 (46.4)	1763 (14.8)	932 (7.8)	NA	20 (0.2)	0 (0.0)	3370 (28.2)	299 (2.5)	26 (0.2)	1270	11 952 (100.0)
Lacrosse	570 (37.9)	0 (0.0)	197 (13.1)	313 (20.8)	1 (0.1)	0 (0.0)	361 (24.0)	63 (4.2)	0 (0.0)	1	1505 (100.0)
Soccer	758 (53.1)	193 (13.5)	126 (8.8)	NA	0 (0.0)	0 (0.0)	304 (21.3)	46 (3.2)	0 (0.0)	152	1427 (100.0)
Wrestling	1823 (84.5)	11 (0.5)	NA	NA	0 (0.0)	0 (0.0)	21 (1.0)	263 (12.2)	39 (1.8)	13	2157 (100.0)
Total	9803 (49.2)	2323 (11.7)	1673 (8.4)	314 (1.6)	27 (0.1)	3 (<0.1)	4899 (24.6)	799 (4.0)	67 (0.3)	1626	19 908 (100.0)
Girls' sports											
Basketball	763 (44.3)	281 (16.3)	187 (10.9)	NA	1 (0.1)	1 (0.1)	461 (26.7)	28 (1.6)	2 (0.1)	172	1724 (100.0)
Field hockey	208 (17.2)	109 (9.0)	368 (30.3)	234 (19.3)	0 (0.0)	0 (0.0)	175 (14.4)	119 (9.8)	0 (0.0)	252	1213 (100.0)
Lacrosse	337 (39.4)	50 (5.9)	151 (17.8)	25 (2.9)	0 (0.0)	0 (0.0)	243 (28.4)	49 (5.7)	0 (0.0)	127	855 (100.0)
Soccer	680 (49.6)	162 (11.8)	108 (7.9)	NA	4 (0.3)	0 (0.0)	389 (28.4)	29 (2.1)	0 (0.0)	133	1372 (100.0)
Softball	311 (35.5)	15 (1.7)	124 (14.1)	3 (0.3)	75 (8.6)	0 (0.0)	240 (27.4)	108 (12.3)	1 (0.1)	5	877 (100.0)
Volleyball	682 (40.3)	226 (13.4)	199 (11.8)	NA	1 (0.1)	0 (0.0)	470 (27.8)	113 (6.7)	1 (0.1)	166	1692 (100.0)
Total	2981 (38.5)	843 (10.9)	1137 (14.7)	262 (3.4)	81 (1.0)	1 (<0.1)	1978 (25.6)	446 (5.8)	4 (0.1)	855	7733 (100.0)
Overall	12 784 (46.3)	3166 (11.5)	2810 (10.2)	576 (2.1)	108 (0.4)	4 (<0.1)	6877 (24.9)	1245 (4.5)	71 (0.3)	2481	27 641 (100.0)

Abbreviation: NA, not applicable.

[a] Collegiate data were from the National Collegiate Athletic Association Injury Surveillance Program; high school data, from the National Athletic Treatment, Injury and Outcomes Network Surveillance Program.

players (grades 4–8) in 2002 and 2003. They provided a comparable definition for a *reportable injury* and noted a comparable rate for NTL injuries (10.5/1000 AEs). These discrepancies among reported NTL injury rates may be attributable to differences related to study periods and samples, as well as variations in how ATs reported NTL injuries. For example, Kerr et al[23] found that, in the high school setting, the rate of reported NTL injuries was higher as reported by full-time ATs than by outreach ATs (ie, ATs employed by outside settings or graduate-assistant ATs from nearby universities). However, decreased injury rates may also indicate improvements in recovery or training methods aimed at reducing the risk of overuse injuries. Given that so few researchers have examined NTL injuries at the collegiate or high school levels, future prospective research is warranted to better ascertain time trends and examine reporting and incidence variations by level, employment status, and other confounders.

Body Parts and Diagnoses

Most TL injuries previously reported in both the collegiate and high school settings affected the lower extremity and were diagnosed as sprains, strains, contusions, fractures, and concussions.[3,24–38] Non–time-loss injuries also included large proportions of sprains, strains, and contusions, but fractures and concussions were less prevalent. The findings may indicate appropriate care for these typically severe injuries.[39] Our observed NTL injury rates for sprains were somewhat unexpected, as sprains often result in TL from activity.[40] Whereas we cannot conclude this from our investigation, advanced treatment and therapeutic methods may be allowing more athletes to compete with sprains. The burden this places on the AT is unclear, as managing potentially debilitating injuries while an athlete is fully active can be time and labor intensive. On the other hand, our finding that concussions constituted a large proportion of TL injuries was not unexpected. Recent recommendations[41,42] for concussion management and awareness have given pause to the practice of same-day return to participation. For sports such as baseball, the shoulder accounted for a large proportion of NTL injuries. Identifying specific body parts in a particular sport with a high rate of NTL injuries could be useful as clinicians seek to build effective injury-prevention programs. Further longitudinal studies can benefit from recording information about NTL injuries in context with injury-prevention programs. These data may yield important information about the efficacy of various injury-prevention programs.

Limitations

Our study had limitations. A possible limitation to our definition of *injury* was that it does not account for unspecified pain or loss of function. A novel injury-monitoring approach[43] has enabled researchers to explore the prevalence of injuries, including conditions causing unspecified pain. This is an intriguing concept, as clinicians may spend considerable time and resources treating painful conditions and injuries without necessarily considering them reportable. Thus, sports-injury surveillance may be missing important conditions that add to the overall work burden for ATs. In the future, researchers should investigate the feasibility of modifying the injury definition to include conditions that result in pain or functional limitations independent of TL or injury diagnosis.[44–46] Including NTL injuries will provide a more complete picture of the work burden on ATs and other sports medicine professionals.

In addition, investigators should aim to better examine current injury documentation for surveillance purposes. For example, in a recent study focusing on overuse injuries, Roos et al[47] found that 62.4% of overuse injuries were reported to surveillance programs. Increased efforts to improve injury documentation will help to not only better estimate the incidence of sport-related injuries but also highlight the full breadth of care and management of such injuries that ATs provide.

Furthermore, given that some injury-surveillance programs have captured only TL injuries,[3–8] NTL injuries have seldom been examined. However, it is possible that some NTL injuries were captured in previous studies. For example, beginning in the 2007–2008 academic year, the High School Reporting Information Online (RIO) captured NTL dental injuries, fractures, and concussions.[48] At the same time, it is possible that NTL injuries were inadvertently entered into injury-surveillance programs and thus misclassified as TL injuries. Consequently, when comparing our data with earlier data, researchers must consider such potential factors that may be associated with injury documentation.

Our study included other limitations. Whereas the NCAA-ISP has been validated to capture TL injuries, it has also been shown to slightly underreport those injuries. It is unclear how effective injury-surveillance systems are for capturing NTL injuries.[49] However, we believe that collecting data through preexisting electronic health record systems helps ensure that as many injuries as possible that are detected and managed by team medical staff are being captured and reported to the NCAA-ISP and NATION-SP. Still, variations in reporting of NTL injuries may exist.[23]

Lastly, our collegiate and high school data consisted of convenience samples that may not be generalizable to all student-athletes. For example, whereas our data originated from collegiate programs in all 3 divisions, we do not have data from the National Association of Intercollegiate Athletics or the National Junior College Athletic Association. Despite these limitations, we believe our sample was both large and diverse enough to provide valuable information about NTL injuries in both the collegiate and high school settings.

CONCLUSIONS

Non–time-loss injuries comprise large proportions of injuries reported in collegiate and high school sports. The proportion and rate of these injuries were higher in high school than in collegiate student-athletes. However, given the dearth of research in this area, additional research on the epidemiology of NTL injuries is warranted. Accounting for NTL injuries will improve the understanding of actual injury rates among these student-athletes. In addition, these data will help inform a more complete picture of the work burden placed on sports medicine professionals and athletes.

ACKNOWLEDGMENTS

The NCAA-ISP data were provided by the Datalys Center for Sports Injury Research and Prevention. The ISP was funded by

the NCAA. The NATION was funded by the National Athletic Trainers' Association Research and Education Foundation (Carrollton, TX) and the Central Indiana Corporate Partnership Foundation (Indianapolis, IN) in cooperation with BioCrossroads (Indianapolis, IN). The content of this report is solely the responsibility of the authors and does not necessarily reflect the views of the NCAA, the National Athletic Trainers' Association Research and Education Foundation, the Central Indiana Corporate Partnership Foundation, or BioCrossroads.

We thank the many athletic trainers who volunteered to submit data to the NCAA-ISP and NATION. Their efforts are greatly appreciated and have positively affected the safety of high school and collegiate athletes.

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